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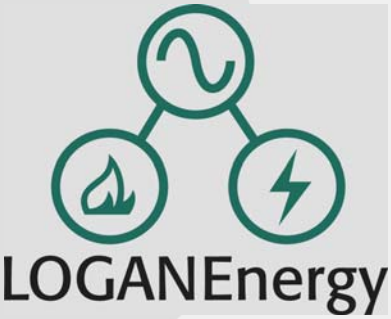

NAS Keflavik – Keflavik International Airport
PEM Demonstration Project
Initial Project Report

Proton Exchange Membrane (PEM) Fuel Cell Demonstration
Of Domestically Produced PEM Fuel Cells in Military Facilities

US Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research Laboratory
Broad Agency Announcement CERL-BAA-FY04

Headquarters:

1080 Holcomb Bridge Rd
Suite 100-175
Roswell, GA 30076
Ph (770) 650-6388

Keflavik International Airport
Keflavik, Iceland

December 19, 2005

California:

5680 Adobe Road
29 Palms, CA 92277
Ph (760) 367-5005

Executive Summary

Under terms of its FY'04 DOD PEM Demonstration Contract with ERDC/CERL, LOGANEnergy will install and operate a Plug Power Gencore 5kWe auxiliary fuel cell power plant (see Appendix section 1) at the Leifur Eríksson Air Terminal at the Keflavik International Airport in Keflavik, Iceland.

The Keflavik Airport is a major stopping point between North America and Europe as well as a vacation destination in its own right. The airport served 1.6 million passengers in 2004. The hydrogen powered unit will be electrically configured to provide DC electricity to a simulated DC bus next to the terminal building. In this configuration it will simulate support of critical or emergency loads so that PEM fuel cell power generation can be properly evaluated as a back-up power source. Local electrical and mechanical contractors may be hired to provide services as needed to support the installation tasks.

Iceland's stated goal of being the first nation in the world to convert entirely to a hydrogen economy makes it an ideal location for a PEM fuel cell demonstration. A very strong team has been developed to assist with this project. This team includes interested parties from the Naval Air Station Keflavik, the Icelandic Ministry of Foreign Affairs, the Technological Institute of Iceland, the US Embassy in Iceland and the Icelandic New Energy company, a world leader in hydrogen fueled vehicles.

The POC for this project is:

Mr. Jon Bjorn Skulason
General Manager
Icelandic New Energy Ltd.
PO Box 8192
128 Reykjavik
Iceland

Bus: (354) 588-0310
Mobile: (354) 863-6510
Bus Fax: (354) 588-0315
E-mail: skulason@newenergy.is
Web Page: http://www.newenergy.is

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Proposal – Proton Exchange Membrane (PEM) Fuel Cell Demonstration of Domestically Produced Residential PEM Fuel Cells in Military and Federal Government Facilities

1.0 Descriptive Title

LOGANEnergy Corp. Small Scale PEM Demonstration Project at the Leif Eriksson Air Terminal at the Keflavik International Airport in Keflavik, Iceland.

2.0 Name, Address and Related Company Information

LOGANEnergy Corporation

1080 Holcomb Bridge Road
BLDG 100- 175
Roswell, GA 30076
(770) 650- 6388

DUNS 01-562-6211
CAGE Code 09QC3
TIN 58-2292769

LOGANEnergy Corporation is a private Fuel Cell Energy Services company founded in 1994. LOGAN specializes in planning, developing, and maintaining fuel cell projects. In addition, the company works closely with manufacturers to implement their product commercialization strategies. Over the past decade, LOGAN has analyzed hundreds of fuel cell applications. The company has acquired technical skills and expertise by designing, installing and operating over 30 commercial and small-scale fuel cell projects totaling over 7 megawatts of power. These services have been provided to the Department of Defense, fuel cell manufacturers, utilities, and other commercial customers. Presently, LOGAN supports 30 PAFC and PEM fuel cell projects at 21 locations in 12 states, and has agreements to install 22 new projects in the US and the UK over the next 18 months.

3.0 Production Capability of the Manufacturer

Plug Power manufactures a line of PEM fuel cell products at its production facility in Latham, NY. The facility produces three lines of PEM products including the 5kW GenSys5C natural gas unit, the GenSys5P LP Gas unit, and the Gencore 5kWe standby power system. The current facility has the capability of manufacturing 10,000 units annually. Plug will support this project by providing remote monitoring, telephonic field support, overnight parts supply, and customer support. These services are intended to enhance the reliability and performance of the unit and achieve the highest possible customer satisfaction. Vincent Cassala is the Plug Power point of contact for this project. His phone number is 518.782.7700 ex1228, and his email address is Vincent_cassala@plugpower.com.

4.0 Principal Investigator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	724-449-4668
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	kspitznagel@loganenergy.com

5.0 Authorized Negotiator(s)

Name	Samuel Logan, Jr.	Keith Spitznagel
Title	President	Vice President Market Engagement
Company	Logan Energy Corp.	Logan Energy Corp.
Phone	770.650.6388 x 101	724-449-4668
Fax	770.650.7317	770.650.7317
Email	samlogan@loganenergy.com	kspitznagel@loganenergy.com

6.0 Past Relevant Performance Information

a) Contract: PC25 Fuel Cell Service and Maintenance Contract #X1237022

Merck & Company
Ms. Stephanie Chapman
Merck & Company
Bldg 53 Northside
Linden Ave. Gate
Linden, NJ 07036
(732) 594-1686

Four-year PC25 PM Services Maintenance Agreement.
In November 2002 Merck & Company issued a four-year contract to LOGAN to provide fuel cell service, maintenance and operational support for one PC25C fuel cell installed at their Rahway, NJ plant. During the contract period the power plant has operated at 94% availability.

b) Contract: Plug Power Service and Maintenance Agreement to support one 5kWe GenSys 5C and one 5kWe GenSys 5P PEM power plant at NAS Pawtuxet River, MD.

Plug Power
Mr. Scott Wilshire.
968 Albany Shaker Rd.
Latham, NY 12110
(518) 782-7700 ex 1338

c) Contract: A Partners LLC Commercial Fuel Cell Project Design, Installation and 5-year service and maintenance agreement on 600kW UTC PC25 power block.
Contract # A Partners LLC, 12/31/01

Mr. Ron Allison
A Partner LLC
1171 Fulton Mall
Fresno, CA 93721
(559) 233-3262

7.0 Host Facility Information

Keflavik Airport was constructed by the United State during World War II for military purposes and inaugurated on March 24, 1943. In 1946 an agreement was signed between the Icelandic and the US Governments to the effect that all military personnel should leave Iceland and between 1947-1951 the airport was operated by US civilian contractors. On May 5, 1951 following a request from NATO, in which Iceland was already a member since March 1949, a Defense Agreement was signed between Iceland and the United States where the US assumed the defense of Iceland and the areas around the country on behalf of NATO.

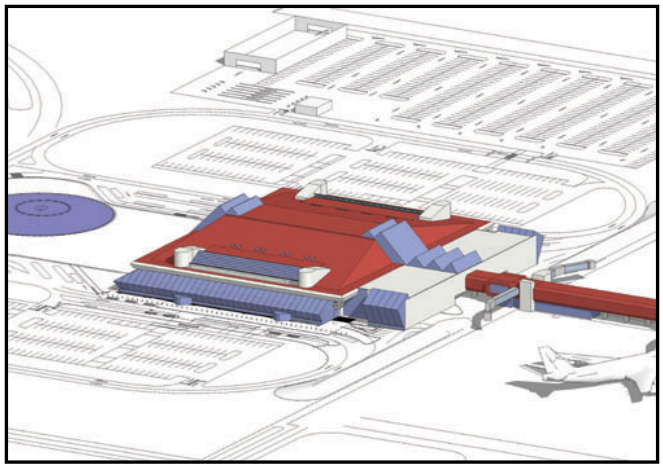

Figure 1: Leifur Eriksson Air Terminal, Keflavik International Airport

Since the end of the Cold War the military activity has decreased considerably. The US Navy has a squadron of Lockheed P3 Orion anti-submarine aircraft and the US Air Force McDonnell-Douglas F-15 Eagle fighters; furthermore C-130 Hercules, KC-135 Strato-tanker and Sikorsky 60 rescue helicopters are stationed here.

Today Keflavik Airport is a joint civil and military airport, operated by the Icelandic Civil Aviation Administration and the US Navy. The airport is situated on the Reykjanes peninsula 50 kilometers south-west from Reykjavík the Capital. The airport area is approximately 25 square kilometers. Keflavik Airport is open for business 24 hrs a day, 7 days a week, 52 weeks a year. During the peak season there are about 1,000 civil aviation related jobs on the airport. In 2004 Keflavik Airport handled over 1.6 million passengers.

The Leifur Eríksson Air Terminal was inaugurated in April 1987 and was initially 24,000 square meters. A 15,000 square meters addition was completed in the spring of 2001.

8.0 Fuel Cell Site Information

Do to security concerns the grassy area north of the terminal building was selected as the most desirable location to place the fuel cell pad site. (See "X" in Figure-2 to right). Service access to the fuel cell will be by way of the adjacent driveway to the east of the unit. This will be very convenient for hydrogen deliveries and visitors going to see the fuel cell.

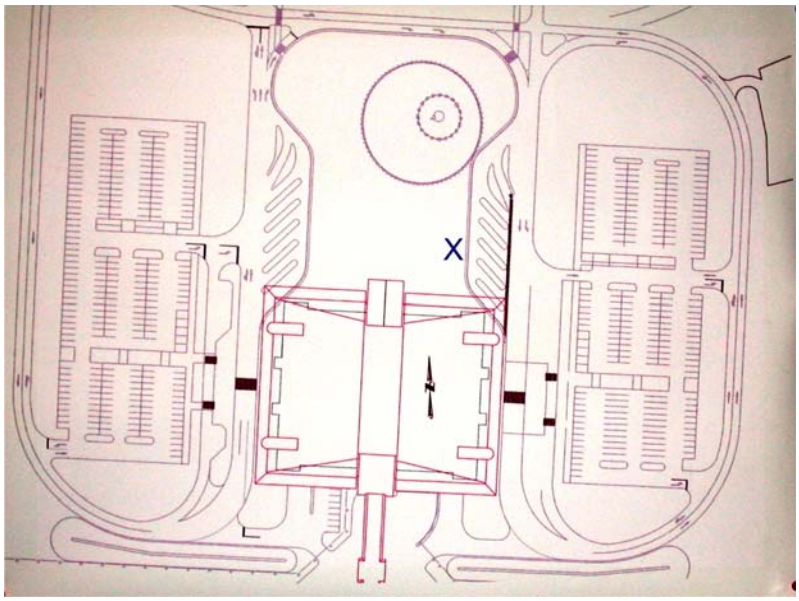

Figure 2: Fuel Cell Site Location Map

The pad site will be located just to the right of the individuals seen in Figure-3 below. The water behind the men is the temporarily drained pond surrounding the famous "Egg" sculpture. Being right outside the terminal building at Keflavik International airport, this sculpture is both one of the first and last sights for visitors to Iceland. Locating the fuel cell between the terminal building and the "Egg" will result in very high visibility for the PEM fuel cell demonstration. Made of highly polished metal, the sculpture has a strong link to aviation, as it shows a "jet" emerging from an egg which very much resembles an engine pod. The "jet" is strikingly similar in lines and shape to the Concorde.

Conduit from the fuel cell will access the below-grade electrical room in the north-east corner of the terminal. The length of this electrical conduit will be less than 75 feet.

Figure 3: "Egg" Sculpture by Magnus Tómasson

9.0 Electrical System

The Plug Power Gencore™5T is a hydrogen fueled back-up DC power generator (up to 5 kW net output). Hydrogen fuel supply will be stored onsite in a Chemical Energy Storage module (CESM), and the cylinders will be provided by a local industrial gas vendor. The standard product application is back-up power for Telecommunications equipment (switching equipment, and other critical loads) in the event grid power is interrupted to the facility. The system will provide positive 48-56 nominal output voltage to a dummy DC bus panel that will power 1 kW of installed DC lighting for the 1 year CERL demonstration. A 1200 watt DC power supply will provide power to a programmable duty cycle timer used for the demonstration and the cabinet heater and the batteries when the Gencore is not operating.

The Gencore performs periodic "conditioning" cycles, automatically, that provide diagnostic/self-check of its controls, subsystems and auxiliary equipment. However, the unit will be programmed to support at least one daily 20-minute operating duty cycle to validate its reliability to support variable and spontaneous load demands. A programmable timer will be used to initiate each test duty cycle. The success of the Icelandic demonstration project will be based upon the system's ability to meet the CERL PEM Demonstration Program availability requirement of at least 90% of the induced duty cycles. The line diagram pictured below in Figure-4 illustrates the manner in which the unit will be installed at the Keflavik Airport Main terminal Building.

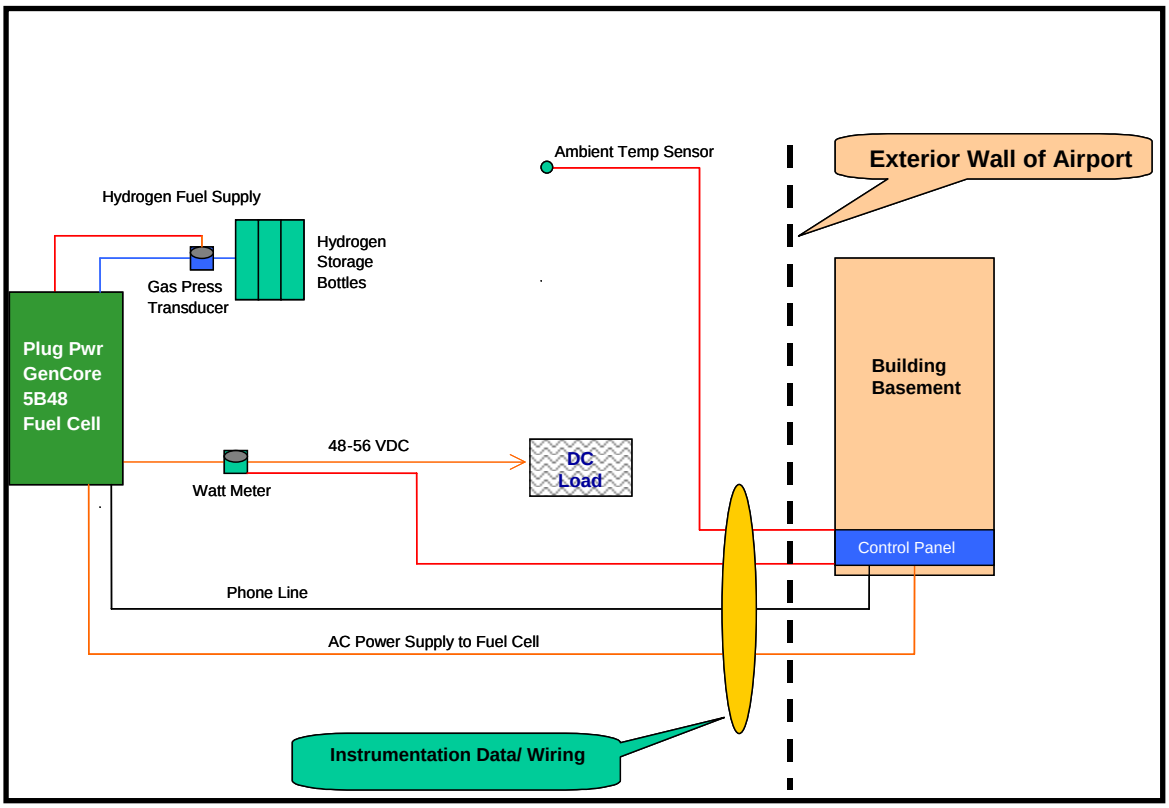

Figure 4: Keflavik Airport GenCore Installation One Line Diagram

10.0 Data Acquisition

The Gencore controller will record and store operating data including test cycles and kWh provided to the DC load bus. The CESM Hydrogen Storage Module will provide remote monitoring of hydrogen pressure to assist in hydrogen supply logistics. This data will be downloaded remotely each day into a readable format in order to maintain an operating record of the test site. In addition the system will be programmed to send an alarm if it fails any duty cycle or if it experiences any failure requiring service.

11.0 Economic Analysis

Table 1: Keflavik Airport Terminal Building Economic Analysis

Keflavik Airport Terminal Building

First Cost			**Budgeted**	**Actual**
Plug Power 5 kW GenCore			$ 15,000.00	
Shipping			$ 2,400.00	
CESM Hydrogen Storage Module			$ 5,000.00	
Installation electrical			$ 3,720.00	
Installation mechanical & hydrogen manifold			$ 3,720.00	
Data Interface			$ 685.00	
Site Prep, labor materials			$ 650.00	
Technical Supervision/Start-up			$ 4,500.00	
Total			**$ 35,675.00**	
				$ -
Forcast Operating Expenses	Volume	$/Hr	$/ Yr	
Hydrogen			$ 10,800.00	
Total Annual Operating Cost				$ 10,800.00
Economic Summary				
Forcast Annual kWH		1217		
Annual Cost of Operating Power Plant		$ 8.877	kWH	

12.0 Kickoff Meeting Information

The Keflavik Airport Terminal building kick-off meeting is scheduled for April 28, 2005. At the meeting Dr. Mike Binder, representing CERL, and Sam Logan, representing LOGANEnergy, will present the scope of the PEM demonstration project and the installation plan to interested parties at the airport terminal.

Any issues that cannot be resolved at the kickoff meeting will put the commencement of the installation on hold until the POC submits a statement in writing to Frank Holcomb that the project is ready to begin.

The Agenda for the Kickoff meeting is:

- Introductions- *All (10 minutes)*
- Background and Expectations of PEM Demonstration Program- *Dr. Mike Binder (10 minutes)*
  - CERL-BAA Requirements
- Introduction of Project Team- *Sam Logan, Jon Bjorn Skúlason (20 minutes)*
  - LOGANEnergy Overview
  - Icelandic New Energy Overview
- Project Description- *Sam Logan,(45 minutes)*
  - Technology Overview
  - Project Installation Plan
  - Project Management Plan
  - Technical Training
  - Data Reporting and Communications
  - Site Issues – open discussion
- Icelandic Partners Fuel Cell Perspective – *Jon Bjorn Skúlason, Ragnar Baldursson (30 minutes)*
- Airport Management Perspectives – *(20 minutes)*
- Site Tour- *Participants travel to airport site (2:00 minutes)*

13.0 Appendix

Section-1 Gencore 5B48 Product Specifications

PRODUCT CHARACTERISTICS			B
Performance	Net Output[1]	0 to 5,000W	✓
	Adjustable Voltage Output	– 46Vdc to –56Vdc	–
		+46Vdc to +56Vdc	✓
	Operating Range – Voltage	– 42Vdc to – 60Vdc	–
		+42Vdc to +60Vdc	✓
	Operating Range – Current	0 to 109 Amps	✓
Fuel	Gaseous Hydrogen	99.95% (dry)	✓
	Supply Pressure	80 +/- 16 psig	✓
	Fuel Consumption	40 slm at 3,000W	✓
		75 slm at 5,000W	✓
Operation	Ambient Temperature	-40C to 46C	✓
	Relative Humidity	0% to 95% non-condensing	✓
	Altitude	-197ft to 6,000ft	✓
Physical	Dimensions	44" x 26"W x 24"D	✓
	Weight	500 lbs	✓
Safety	Compliance	FCC Class A	✓
		ANSI Z21.83	✓
		UL	✓
		Telcordia GR 63, 78,487, 1089	–
Emissions	Water	Maximum 2.0 liters per hour	✓
	Co, CO2, NOx, SOx	<1ppm	✓
	Audible Noise	60dba @ 1m	✓
Sensors	Gas Hazard Sensor		✓
	Pad Shear		O
	Water Intrusion		O
	Tampering		O
Control	Microprocessor w/Diagnostics		✓
	2 LED Alarm Panel		✓
	Communications	RS-232	✓
		Digital Form "C" output	✓
		Modem	O

Keflavik Airport Terminal PEM Fuel Cell Demonstration Project

Installation, Monitoring, Performance Evaluations, & Reporting on One Plug Power PEM GenCore Fuel Cell

Column Headings Indicate the Beginning of Each Month

Installation Schedule